OUTBREAK OF *SHIGELLA SONNEI* IN KANSAS CITY METRO AREA IN KANSAS, 2005

Outbreak investigators
Ida Nesmith, Disease Containment Manager [π]
Jose Izaguirre, Epidemiologist [π]
Wusan Chen, Epidemiologist (former employee) [π]
Denise Brennan, Epidemiology Nurse Specialist [π]
Danyel Oslon, Epidemiologist [π]
Renee Semarge, Epidemiologist (former employee) [π]
Kim Bragdon, Registered Nurse [§]
Mavis Perkins, Communicable Diseases Manager [±]
Linda Redding, Registered Nurse [±]
Jason Cummins, Surveillance Coordinator [±]
Nkolika Obiesie, Epidemiologist [¶]

Report Author
Nkolika Obiesie

[π] Johnson County Health Department
[§] Leavenworth County Health Department
[±] Unified Government of Wyandotte County Public Health Department
[¶] Kansas Department of Health and Environment

Report Date
April**,** 2006

Introduction

The Kansas City (KC), Kansas metro *Shigella sonnei* outbreak started following the initial phase of the Kansas City Missouri metro *Shigella* outbreak which started in January of 2005. Early cases of *Shigella sonnei* was first noticed among Kansans residents in Johnson and Wyandotte County in late March through April of 2005. The number of new cases peaked in July of 2005 following a cluster of cases in a Summer Camp in Wyandotte County. The number of new cases continues to fluctuate until December 2005. A decline in new cases occurred in late December 2005 through early January of 2006.

A total of 210 confirmed cases and 12 probable cases were identified from the beginning in March, 2005 to end of January, 2006 when the outbreak was determined to be over.

Background

Kansas City metro includes counties in Kansas and Missouri across shared borders in Kansas City metro area with virtually no identifiable land space separating the two states in KC. The Missouri side of the metro consists of five counties, and there are three counties on the Kansas side, with a total of 10 public health departments. The Kansas counties are Leavenworth, Johnson and Wyandotte. According to the 2004 population estimate, the total population of Kansas is 2735,502. Johnson County is the first largest County in Kansas with a population of 496,691, Wyandotte is the fourth Largest with a population of 156,487 and Leavenworth has a population of 72,439. The Kansas metro Counties (Johnson, Leavenworth and Wyandotte) together make up 27% of the Kansas population, while Johnson and Wyandotte alone make up 24% of the Kansas population.

Shigella is an enteric illness of variable severity, clinically manifested by diarrhea which may be bloody or contain mucous, fever, nausea, cramp, and tenesmus. The causative organism is bacteria including *Shigella dysenteri, S. flexneri, S. boydii, and S.sonnei. Shigella sonnei* is the most commonly occurring of the *Shigella* species and have been implicated with most outbreaks. Incubation period varies from 1 to 7 days, with average of 2-4 days. Source of infection is from feces of infected humans, and transmission is mainly through fecal-oral directly or indirectly from a patient or carrier. No animal reservoir is known. Person infected with *Shigella* is infections through the period of acute illness until the organism is no longer present in the feces.

Outbreak Investigation

In March-April of 2005, following increase in number of cases of *Shigella sonnei* reported in Johnson and Wyandotte County with no known common exposures, epidemiological investigation was initiated at the County level to actively follow-up on any new cases of *Shigella*. This decision was also partially based on the knowledge that counties on the Missouri side of the metro have been investigating increase number of cases of *Shigella sonnei*.

In July, 2005, investigations in Wyandotte County lead to identification of cluster of new cases of *Shigella sonnei* in a summer camp in eastern Wyandotte. A total of 22 cases were associated with this cluster, 10 confirmed cases and 12 probable cases. The Summer Camp cluster was followed up and investigated separately, but considered a pocket of the on-going outbreak.

Phone interviews were conducted by staff of Wyandotte County Health Department, Division of Communicable Disease, using the enteric questionnaire.

The case definition was: a student or teacher at the elementary school summer camp or their family contact who had diarrhea or abdominal cramping starting July 8, 2005 to the end of the summer camp in August 4, 2005.

In September 2005, Kansas City Missouri Health Department invited CDC to assist in the metro outbreak. A bi-state meeting was held at the City Health Department with four CDC representatives from the Division of Diarrhea Diseases.

After the meeting, CDC team decided to work very closely with the Counties in Missouri to study the outbreak over on the Missouri side, and then share the findings and recommendations with both states. This decision was made because Kansas did not have an outbreak in any of the child-care centers unlike in Missouri. Also a lot of intervention measures were already in place on the Kansas side.

The details of the CDC studies will be presented in a different report and in a bi-state MMWR article on the whole metro outbreak.

Interventions

During the initial phase of the outbreak, Kansas Counties worked with the Missouri Counties, the regional state epidemiologists and the County public relation officers to create a common health alert message. This was distributed to Local Health Departments in northeast region of Kansas, physicians, schools and child-care centers via the state public health information system (PHIX) and the counties health alert network system (HAN).

Regular updates on prevention, control, sensitivity and treatment were provided through PHIX and HAN to the physicians, schools and child-care centers.

In late July to early August 2005 before the beginning of the school year, a letter was sent out to the School Superintendent office in Wyandotte Counties, which is the county where we have seen majority of the cases. Enclosed in the letter were samples of educational fliers to send home with students and posters on *shigell*a and hand washing.

Educational fliers were distributed to the retailers in Wyandotte County. County nurse worked with the school nurses to demonstrate proper hand washing in schools using the glow worm kit. Guidelines for prevention and control of *Shigella* outbreak in school-age children was developed in anticipation of any outbreak in school that could not be prevented with the control measures already in place.

Laboratory Method

Cases were tested mostly through their primary physicians, and depending on which state the hospital, clinic or initial testing laboratory was located, isolates were sent to either Kansas State or Missouri State Laboratory for the purpose of performing pulse-field gel electrophoresis (PFGE) DNA sub typing. 91% (203) of the cases had PFGE DNA sub typing performed on their isolates. Of these 203, 64 were done in Kansas and 139 were done in Missouri. Among those done in Kansas, PFGE SONx088 (21) was the most frequently occurring pattern, followed by SONx073 (10), and then SONx121 (6). Among those done in Missouri, PFGE MOS165 (26) and MOS307 (26) were the two most frequently occurring patterns, followed by MOS234 (25), and then MOS188 (13).

The PFGE patterns from both states could not be matched because of the different naming system used by each state.

Outbreak Investigation Result

A total of 222 cases were association with the Kansas City metro *Shigella sonnei* outbreak; 210 (94.6%) laboratory confirmed cases and 12 (5.4%) probable cases. Cases ranged in age from 0-93 years old. Of the 222 cases, 22 were associated with the summer camp cluster.

Of the 22 cases, 10 were laboratory confirmed and 12 were epidemiologically linked to a confirmed case. 59% (13) were male and 41% (9) were female. Camp cases; primary and secondary ranged in age from 1 to 40 years old, with 64% (14) within the age group of 5-12 years.

Table 1. Number and Percent of Kansas City, Kansas Cases by County, Sex, Age group and Zip code

Characteristic		Case	
		No.	**(%)**
County	n=222		
Johnson		46	21
Leavenworth		28	12
Wyandotte		148	67
Sex	n=222		
Male		95	43
Female		127	57
Age group	n=221		
0-3 years		50	23
4-9 years		89	40
10-19 years		19	9
20-39 years		43	20
40 and above		17	7
Unknown		3	1
Zip	n=219		
(with cases >=10)			
66104		46	21
66102		32	15
66048		24	11
66106		22	10
66112		14	6
66109		13	6
Others		68	31

Figure 1.

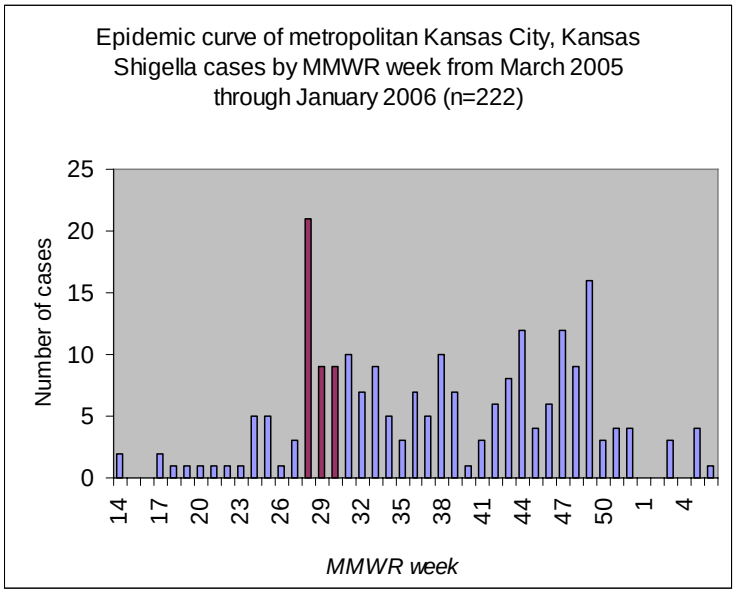
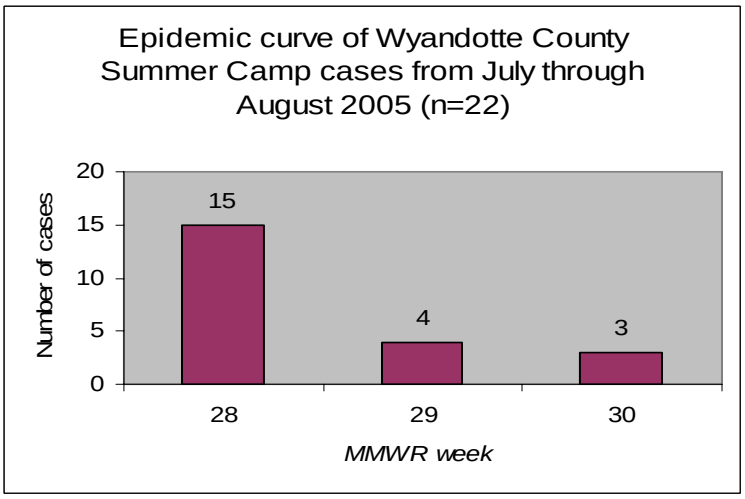


Figure 2.



Discussion

The shape of the epidemic curve suggests an initial possible person-to-person transmission, with some intermittent common source exposures resulting to the spikes noticed for the MMWR weeks 28, 44 and 49. The first spike on week 28 represents the summer camp cluster which most likely resulted from a common source exposure that was never determined, since cases started having symptoms within the same incubation period after the school field trip to a Missouri park.

The studies conducted by the Epidemiology (EPI) Aide team from CDC were not gear towards determining the source of the outbreak. They were meant to study the

predisposing factors in day-care facilities, physicians' willingness to recommend laboratory testing for *shigella*, physicians' willingness to prescribe antibiotic treatment, and the burden of *shigella* outbreak on local agencies; day-care centers and public health departments.

Cases were seen in day-cares during the investigations, but no outbreak was determined to have occurred in any of the child-care facilities in Kansas. Of the 60% (139) of our cases who were between the ages of 0-9 years old that could possibly be attending daycare, information on whether the case attended any day care facility was obtained from only 25% (35) of them. 13% (18) of these children aged 0-9 years old were determined to be in a day-care system.

Conclusion

Based on the information collected during the outbreak investigation, the primary source of the outbreak could not be determined regardless of vigorous efforts made by both the state and county officials. The various intervention methods taken; the regular health alert updates, the demonstration of proper hand washing technique in schools, the distribution of educational fliers on *shigella* prevention and control in school and grocery stores, and the new guideline for prevention and control of s*higella* outbreak in school-aged children, may have helped contained the outbreak and had prevented an outbreak in any of the child-care facilities and schools.

The nature of this outbreak, crossing state borders, required much cooperation between city, county, and local health departments in both states. Every level of public health was involved with the addition of the EPI Aide team from CDC invited to assist Missouri. The teamwork involved resulted in strengthened relationships between the public health departments in KC metro on both sides of the border, and also between different agencies in the local health departments.

Limitations

The metro *shigella* outbreak was a challenge to investigate because of its magnitude and cross-border issues. Majority of the cases were reported from the laboratory following a positive result, and most of the time the case had gone through the greater part of their infectious period before the health department was notified. Parents and guardians were very reluctant to release needed information on their children to the County Health Departments for fear that their children will be excluded from day-care and/or school. This resulted to an incomplete collection of data. Some families never returned calls from their local health officials and as a result, some opportunities to link cases were missed. Enough resources were not available to pursue very many individual cases.
Few physicians especially pediatricians were not willing to recommend testing for symptomatic persons, referring to the symptoms as "stomach flu". Some others were treating with antibiotics without testing. *Shigella* developed resistant to different antibiotic during the course of the outbreak. A day-care provider with a positive stool culture was treated with three courses of antibiotic therapy, using antibiotics for which the organism was resistant because the doctor never looked at the antibiotic sensitivity result.